Antidegradation Examples Using the Revised Rules for the Great Lakes Basin
Revised June 30, 2008

New Industrial Discharger

A new manufacturing facility will have the following pollutants in their discharge: Copper, Lead, Nickel, TCE and Zinc.

Discharger Design Flow = 2.0 MGD
Stream Design Flow = 56.0 MGD

The pollutants that will receive effluent limits based on the reasonable potential to exceed a WQBEL using the procedures found in 327 IAC 5-2-11.5 are: Copper and Zinc. The other pollutants do not have a reasonable potential to exceed the WQBEL. Only the pollutants that have a reasonable potential to exceed the WQBEL or that have a TBEL will be included in the antidegradation review.

Table 1
RPE Analysis

| | Projected Effluent Quality (PEQ) | | | Preliminary Effluent Limits (PEL) | | |
|---|---|---|---|---|---|---|
| Parameter | Monthly Average | Daily Maximum | Units | Monthly Average | Daily Maximum | Units |
| **Copper** | 62.0 | 62.0 | ug/l | 34.0 | 69.0 | ug/l |
| **Lead** | 120.0 | 120.0 | ug/l | 140.0 | 282.0 | ug/l |
| **Nickel** | 490.0 | 490.0 | ug/l | 780.0 | 1560.0 | ug/l |
| **Zinc** | 285.0 | 285.0 | ug/l | 270.0 | 550.0 | ug/l |
| **TCE** | 19.0 | 19.0 | ug/l | 393.0 | 790.0 | ug/l |

The effluent limits based on technology (federal effluent guidelines or BPJ/BAT) are:

Table 2
TBELS

| | Quantity or Loading | | | Quality or Concentration | | | |
|---|---|---|---|---|---|---|---|
| Parameter | Monthly Average | Daily Maximum | Units | Monthly Average | Daily Maximum | Units | Basis |
| **Copper** | 1.6 | 3.2 | lbs/day | N.A. | N.A. | ug/l | ELG |
| **Lead** | 2.1 | 4.2 | lbs/day | N.A. | N.A. | ug/l | ELG |
| **Nickel** | 5.3 | 10.6 | lbs/day | N.A. | N.A. | ug/l | ELG |
| **Zinc** | 8.4 | 16.8 | lbs/day | N.A. | N.A. | ug/l | ELG |
| **TCE** | N.A. | 0.083 | lbs/day | N.A. | 5.0 | ug/l | BPJ/BAT |

The effluent limits based on the De minimis Lowering of Water Quality are:

Table 3
De Minimis

| | Quantity or Loading | | | Quality or Concentration | | | |
|---|---|---|---|---|---|---|---|
| Parameter | Monthly Average | Daily Maximum | Units | Monthly Average | Daily Maximum | Units | Basis |
| **Copper** | 0.57 | 1.15 | lbs/day | 34.0 | 69.0 | ug/l | WQBEL |
| **Lead** | 1.12 | 2.25 | lbs/day | 67.0 | 135.0 | ug/l | WQBEL |
| **Nickel** | 5.3 | 10.6 | lbs/day | N.A. | N.A. | ug/l | DTBEL |
| **Zinc** | 4.5 | 9.2 | lbs/day | 270.0 | 550.0 | ug/l | WQBEL |
| **TCE** | N.A. | 0.083 | lbs/day | N.A. | 5.0 | ug/l | DTBEL |

Table 4
Final Limits

| | Quantity or Loading | | | Quality or Concentration | | | |
|---|---|---|---|---|---|---|---|
| Parameter | Monthly Average | Daily Maximum | Units | Monthly Average | Daily Maximum | Units | Basis |
| **Copper** | 0.57 | 1.15 | lbs/day | 34.0 | 69.0 | ug/l | WQBEL |
| **Lead** | 1.12 | 2.25 | lbs/day | 67.0 | 135.0 | ug/l | WQBEL |
| **Nickel** | 5.3 | 10.6 | lbs/day | N.A. | N.A. | ug/l | WQBEL |
| **Zinc** | 4.5 | 9.2 | lbs/day | 270.0 | 550.0 | ug/l | WQBEL |
| **TCE** | N.A. | 0.083 | lbs/day | N.A. | 5.0 | ug/l | DTBEL |

If the discharger agrees to accept effluent limits that are less than or equal to the limits based on the De minimis Lowering of Water Quality, the discharge will not be considered to be a significant lowering of water quality and no further antidegradation action will be required.

If the discharger wants or needs to discharge any of these substances at a level that is greater than the limits based on the De minimis, then they must submit an antidegradation demonstration unless the activity causing the new or increased discharge is considered by rule to not be a significant lowering of water quality. If the activity causing the new or increased discharge is considered by rule to not be a significant lowering of water quality, then they must demonstrate that it meets one of the exemptions.

Since this is the first antidegradation demonstration or de minimis evaluation in the area of the discharge, the representative background concentration established at this time will be the benchmark for any future antidegradation reviews. The representative background concentration for the pollutants are as follows:

List 1 - Representative Background Concentration (Geometric Mean of the Dataset)
Copper – 2.7 ug/l
Lead – 1.6 ug/l
Nickel – 2.7 ug/l
Zinc – 8.3 ug/l
TCE – 0.0 ug/l

List 2 - The Benchmark Unused Loading Capacity

(Chronic Aquatic Water Quality Criterion mg/l – Representative Background Concentration mg/l) x Stream Design Flow in million gallons per day (MGD) x 8.34 lbs/gallon of water = Unused Loading Capacity in lbs/day.

Copper – (0.021 mg/l – 0.0027 mg/l) x 56 MGD x 8.34 = 8.56 lbs/day
Lead – (0.01475 – 0.0016) x 56 MGD x 8.34 = 6.14 lbs/day
Nickel – (0.12088 – 0.0027) x 56 MGD x 8.34 = 55.2 lbs/day
Zinc – (0.27495 – 0.0083) x 56 MGD x 8.34 = 124.5 lbs/day
TCE – (0.06 – 0.0) x 56 MGD x 8.34 = 28.0 lbs/day

Existing Industrial Discharger

An existing manufacturing facility has the following pollutants in their discharge: Copper, Lead, Nickel, TCE and Zinc.

Existing Design Flow = 2.0 MGD
Proposed Design Flow = 4.0 MGD
Stream Design Flow = 56.0 MGD

Their existing permit limits are:

Table 5
Existing Permit Limits

| | Quantity or Loading | | | Quality or Concentration | | | |
|---|---|---|---|---|---|---|---|
| Parameter | Monthly Average | Daily Maximum | Units | Monthly Average | Daily Maximum | Units | Basis |
| **Copper** | 0.57 | 1.15 | lbs/day | 34.0 | 69.0 | ug/l | WQBEL |
| **Lead** | 2.1 | 4.2 | lbs/day | N.A. | N.A. | ug/l | TBEL |
| **Nickel** | 5.3 | 10.6 | lbs/day | N.A. | N.A. | ug/l | TBEL |
| **Zinc** | 4.5 | 9.2 | lbs/day | 270.0 | 550.0 | ug/l | WQBEL |
| **TCE** | N.A. | 0.083 | lbs/day | N.A. | 5.0 | ug/l | TBEL |

The pollutants that will receive limits based on the reasonable potential to exceed a WQBEL are: Copper, Lead, Nickel and Zinc. TCE does not have a reasonable potential to exceed the WQBEL.

Table 6
RPE Analysis for Existing + Expansion

| | Projected Effluent Quality (PEQ) | | | Preliminary Effluent Limits (PEL) | | |
|---|---|---|---|---|---|---|
| Parameter | Monthly Average | Daily Maximum | Units | Monthly Average | Daily Maximum | Units |
| **Copper** | 62.0 | 62.0 | ug/l | 34.0 | 69.0 | ug/l |
| **Lead** | 120.0 | 120.0 | ug/l | 79.0 | 159.0 | ug/l |
| **Nickel** | 490.0 | 490.0 | ug/l | 440.0 | 880.0 | ug/l |
| **Zinc** | 285.0 | 285.0 | ug/l | 270.0 | 550.0 | ug/l |
| **TCE** | 19.0 | 19.0 | ug/l | 221.0 | 440.0 | ug/l |

The effluent limits based on technology are:

Table 7
TBELs for Existing + Expansion

| | Quantity or Loading | | | Quality or Concentration | | |
|---|---|---|---|---|---|---|
| Parameter | Monthly Average | Daily Maximum | Units | Monthly Average | Daily Maximum | Units |
| **Copper** | 3.2 | 6.4 | lbs/day | N.A. | N.A. | ug/l |
| **Lead** | 4.2 | 8.4 | lbs/day | N.A. | N.A. | ug/l |
| **Nickel** | 10.6 | 21.2 | lbs/day | N.A. | N.A. | ug/l |
| **Zinc** | 16.8 | 33.6 | lbs/day | N.A. | N.A. | ug/l |
| **TCE** | N.A. | 0.167 | lbs/day | N.A. | 5.0 | ug/l |

The effluent limits for the increase based on the De minimis Lowering of Water Quality are:

Table 8
De Minimis Increase

| | Quantity or Loading | | | Quality or Concentration | | | |
|---|---|---|---|---|---|---|---|
| Parameter | Monthly Average | Daily Maximum | Units | Monthly Average | Daily Maximum | Units | Basis |
| **Copper** | 0.57 | 1.15 | lbs/day | 34.0 | 69.0 | ug/l | WQBEL |
| **Lead** | 1.12 | 2.25 | lbs/day | 67.0 | 135.0 | ug/l | WQBEL |
| **Nickel** | 5.3 [7.3] | 10.6 [14.7] | lbs/day | N.A. | N.A. | ug/l | DTBEL |
| **Zinc** | 4.5 | 9.2 | lbs/day | 270.0 | 550.0 | ug/l | WQBEL |
| **TCE** | N.A. [3.7] | 0.083 [7.3] | lbs/day | N.A. | 5.0 | ug/l | DTBEL |

[ ] WQBEL Mass

Table 9
Final Limits = Existing Limits + New De minimis Increase

| Quantity or Loading | | | Quality or Concentration | | | | |
|---|---|---|---|---|---|---|---|
| Parameter | Monthly Average | Daily Maximum | Units | Monthly Average | Daily Maximum | Units | Basis |
| **Copper** | 1.04 | 2.3 | lbs/day | 34.0 | 69.0 | ug/l | Existing + WQBEL |
| **Lead** | 3.22 | 6.45 | lbs/day | 96.5 | 193.0 | ug/l | Existing + WQBEL |
| **Nickel** | 10.6 | 21.2 | lbs/day | N.A. | N.A. | ug/l | Existing + DTBEL |
| **Zinc** | 9.0 | 18.4 | lbs/day | 270.0 | 550.0 | ug/l | Existing + WQBEL |
| **TCE** | N.A. | 0.167 | lbs/day | N.A. | 5.0 | ug/l | Existing + DTBEL |

If the discharger agrees to accept effluent limits that are less than or equal to these limits, the discharge will not be considered to be a significant lowering of water quality and no further action will be required. If the discharger wants or needs to discharge any of these substances at a level that is greater than the limits based on the De minimis, then they must submit an antidegradation demonstration unless the activity causing the new or increased discharge is considered by rule to not be a significant lowering of water quality. If the activity causing the

new or increased discharge is considered by rule to not be a significant lowering of water quality, then they must demonstrate that through an exemption justification.

The representative background concentrations at the time of this request are:

List 3 Representative Background Concentration at the time of the request to increase

Copper = 2.9 ug/l – 2.7 ug/l = 0.2 / 2.7 = 7.4% Increase
Lead = 1.7 ug/l – 1.6 ug/l = 0.1 / 1.6 = 6.3 % Increase
Nickel = 2.8 ug/l – 2.7 ug/l = 0.1 / 2.7 = 3.7 % Increase
Zinc = 8.7 ug/l – 8.3 ug/l = 0.4 / 8.3 = 4.8% Increase
TCE = 0.0 ug/l = 0.0% Increase

The New Unused Loading Capacity is:

List 4 - The New Unused Loading Capacity at the time of the request to increase

(Chronic Aquatic Water Quality Criterion mg/l – Representative Background Concentration mg/l) x Stream Design Flow in million gallons per day (MGD) x 8.34 lbs/gallon of water = Unused Loading Capacity in lbs/day.

Copper – (0.021 mg/l – 0.0029 mg/l) x 56 MGD x 8.34 = 8.45 lbs/day
Percent of Unused Loading Capacity Utilized = 8.56 – 8.45 = .11 / 8.56 = 1.3%
Lead – (0.01475 – 0.0017) x 56 MGD x 8.34 = 6.09 lbs/day
Percent of Unused Loading Capacity Utilized = 6.14 – 6.09 = .05 / 6.14 = 0.8%
Nickel – (0.12088 – 0.0028) x 56 MGD x 8.34 = 55.15 lbs/day
Percent of Unused Loading Capacity Utilized = 55.2 – 55.15 = .05 / 55.2 = 0.09%
Zinc – (0.27495 – 0.0087) x 56 MGD x 8.34 = 124.35 lbs/day
Percent of Unused Loading Capacity Utilized = 124.5 – 124.35 = .15 / 124.5 = 0.1%
TCE – (0.06 – 0.0) x 56 MGD x 8.34 = 28.0 lbs/day
Percent of Unused Loading Capacity Utilized = 0.0%

New Sanitary Discharger

A new Regional Sewer District has been formed to treat wastewater from two small towns that have been on septic systems. The RSD is building a new 0.5 MGD extended aeration treatment system to treat the wastewater from the two small towns. The receiving stream has a design flow of 1 MGD.

The need to have effluent limits for ammonia as N are based on the reasonable potential to exceed the WQBELs. The WQBELs are as follows:

Table 10
RPE Analysis

| | Quantity or Loading | | | Quality or Concentration | | |
|---|---|---|---|---|---|---|
| Parameter | Monthly Average | Daily Maximum | Units | Monthly Average | Weekly Average | Units |
| **Ammonia as N** | | | | | | |
| Summer | 9.2 | 20.9 | lbs/day | 2.2 | 5.0 | mg/l |
| Winter | 9.6 | 20.9 | lbs/day | 2.3 | 5.0 | mg/l |

The effluent limits for Ammonia as N, Total Suspended Solids, CBOD, and Phosphorus are based on the DTBEL are:

Table 11
Technology Based Limits

| | Quantity or Loading | | | Quality or Concentration | | |
|---|---|---|---|---|---|---|
| Parameter | Monthly Average | Daily Maximum | Units | Monthly Average | Weekly Average | Units |
| **$CBOD_5$** | 41.7 | 62.6 | lbs/day | 10.0 | 15.0 | mg/l |
| **TSS** | 41.7 | 62.6 | lbs/day | 10.0 | 15.0 | mg/l |
| **Phosphorus** | 4.2 | -------- | lbs/day | 1.0 | ------- | mg/l |
| **Ammonia** as N | 4.6 | 6.9 | lbs/day | 1.1 | 1.65 | mg/l |

Table 12
De minimis Limits

| Parameter | Quantity or Loading Monthly Average | Daily Maximum | Units | Quality or Concentration Monthly Average | Weekly Average | Units |
|---|---|---|---|---|---|---|
| **$CBOD_5$** | 104.3 | 166.8 | lbs/day | 10.0 | 15.0 | mg/l |
| **TSS** | 125.1 | 187.7 | lbs/day | 10.0 | 15.0 | mg/l |
| **Ammonia** as N | 4.6 | 6.9 | lbs/day | 1.1 | 1.65 | mg/l |
| **Phosphorus** | 4.2 | -------- | lbs/day | 1.0 | ------- | mg/l |

If the discharger agrees to accept effluent limits that are less than or equal to these limits, the discharge will not be considered to be a significant lowering of water quality and no further action will be required.

If the discharger wants or needs to discharge any of these substances at a level that is greater than the limits based on the De minimis, then they must submit an antidegradation demonstration application unless the activity causing the new or increased discharge is considered by rule to not be a significant lowering of water quality.

If the activity causing the new or increased discharge is considered by rule to not be a significant lowering of water quality, then they must submit a Non-significant lowering of water quality application.

Since this is the first antidegradation demonstration or de minimis evaluation in the area of the discharge, the representative background concentration established at this time will be the benchmark for any future antidegradation reviews.

Existing Sanitary Discharger

An existing community is expanding their existing extended aeration treatment system from 5.0 MGD to 7.0 MGD to treat the wastewater from the expansion of the population in the community. The receiving stream has a flow of 55 MGD.

Their existing effluent limits based on a design flow of 5.0 MGD are:

Table 13
Existing Limits

| | Quantity or Loading | | | Quality or Concentration | | |
|---|---|---|---|---|---|---|
| Parameter | Monthly Average | Daily Maximum | Units | Monthly Average | Weekly Average | Units |
| **$CBOD_5$** | 1042.5 | 1668 | lbs/day | 25.0 | 40.0 | mg/l |
| **TSS** | 1251 | 1876.5 | lbs/day | 30.0 | 45.0 | mg/l |
| **Ammonia as N** | | | | | | |
| **Summer** | 130.1 | 196.0 | lbs/day | 3.12 | 4.7 | mg/l |
| **Winter** | 249.0 | 354.5 | lbs/day | 5.97 | 8.5 | mg/l |
| **Phosphorus** | 41.7 | ------ | lbs/day | 1.0 | ---- | mg/l |

The limits for the increase in flow of 2 MGD based on the De minimis Lowering of Water Quality are:

Table 14
De minimis Limits for the Increase

| | Quantity or Loading | | | Quality or Concentration | | |
|---|---|---|---|---|---|---|
| Parameter | Monthly Average | Daily Maximum | Units | Monthly Average | Weekly Average | Units |
| **$CBOD_5$** | 166.8 | 250.2 | lbs/day | 10.0 | 15.0 | mg/l |
| **TSS** | 166.8 | 250.2 | lbs/day | 10.0 | 15.0 | mg/l |
| **Ammonia as N** | 18.3 | 27.5 | lbs/day | 1.1 | 1.65 | mg/l |
| **Phosphorus** | 16.7 | ---- | lbs/day | 1.0 | ----- | mg/l |

The final effluent limits for the increase of 5 to 7 MGD based on the De minimis Lowering of Water Quality are:

Table 15
Existing Limits + De minimis Limits for the Increase

| | Quantity or Loading | | | Quality or Concentration | | |
|---|---|---|---|---|---|---|
| Parameter | Monthly Average | Daily Maximum | Units | Monthly Average | Weekly Average | Units |
| **$CBOD_5$** | 1209.3 | 1918.2 | lbs/day | 20.7 | 32.9 | mg/l |
| **TSS** | 1417.8 | 2126.7 | lbs/day | 24.3 | 36.4 | mg/l |
| **Ammonia as N** | | | | | | |
| **Summer** | 131.4 | 223.5 | lbs/day | 2.3 | 3.8 | mg/l |
| **Winter** | 267.3 | 382.0 | lbs/day | 4.6 | 6.5 | mg/l |
| **Phosphorus** | 58.4 | ---- | lbs/day | 1.0 | ----- | mg/l |

If the discharger agrees to accept effluent limits that are less than or equal to these limits, the discharge will not be considered to be a significant lowering of water quality and no further action will be required.

If the discharger wants or needs to discharge any of these substances at a level that is greater than the limits based on the De minimis, then they must submit an antidegradation demonstration application unless the activity causing the new or increased discharge is considered by rule to not be a significant lowering of water quality.

If the activity causing the new or increased discharge is considered by rule to not be a significant lowering of water quality, then they must submit a Non-significant lowering of water quality application.